

# LASERS TARGET BLOOD CLOTS IN NEW METHOD

Coronary heart disease (CHD) is the leading cause of illness and death in the United States, with an estimated 52 million adults at moderate to high risk. The American Heart Association found that medical costs associated with treating this disease amount to \$56.3 billion per year; lost productivity adds \$8 billion to this cost.

CHD can lead to blood clots in coronary arteries, which impede blood flow and can cause heart attacks. While treatments are available to get rid of blood clots, they are not without problems. Therefore, medical researchers are seeking safer, easier, and cheaper ways to eliminate clots.

One approach is a technology called laser thrombolysis, which is being developed in a cooperative research and development agreement (CRADA) at Los Alamos National Laboratory, or LANL. The laboratory is working with medical experts from all over the Nation, including Palomar Medical Technologies (Beverly, MA), Oregon Health Sciences University (Portland, OR), and St. Vincent's Hospital (Portland, OR). Initiated in early 1995, the U.S. Department of Energy-funded CRADA is scheduled for 3 years of development.

In laser thrombolysis, a laser beam is delivered through an optical catheter, usually inserted in the femoral artery (in the thigh) and threaded into the affected artery of the heart, where a pulsed laser beam destroys the clot. Several years ago, BMDO funded related theoretical laser studies in laser-matter coupling at LANL, which were applied to laser pulses on biological tissue and helped provide insight into this medical technology.

The group is currently conducting Food and Drug Administration (FDA)-sponsored testing, a year-long process that involves 60 heart attack patients at St. Vincent's Hospital, Washington Hospital Center (Washington, DC), Scripps Clinic (La Jolla, CA), and Methodist Hospital (Lubbock, TX). Once developed, laser thrombolysis could annually treat more than 100,000 patients; but before this happens, the method needs to be further refined and FDA approved.

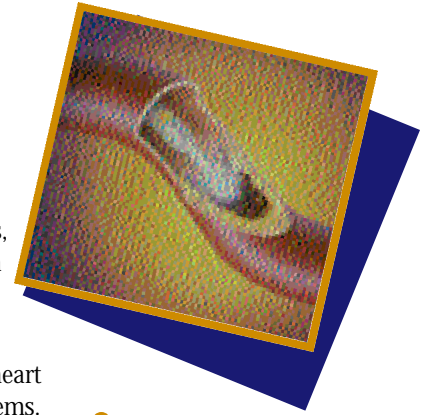
USING BMDO-FUNDED R&D, THE GROUP IS CONDUCTING FDA-SPONSORED TESTING TO ELIMINATE BLOOD CLOTS, A PROCESS THAT INVOLVES 60 HEART ATTACK PATIENTS.

Research findings indicate that laser technology has several advantages over other methods. For example, depending on the patient, laser thrombolysis may reduce the need for injections of clot-busting drugs such as streptokinase and tissue plasminogen activator (tPA), which enzymatically dissolve clots. Suitable for only about 40 to 70 percent of potential patients, these drugs sometimes cause allergic reactions and hemorrhaging. Laser thrombolysis has not

been shown to cause such problems. In addition, since the thrombolysis technique is more selective in destroying the clot, it does not present problems associated with current angioplasty or other treatments, which can damage the artery walls. It also offers cost, recovery time, and safety advantages over bypass surgery, in which surgeons must replace arteries.

## ABOUT THE TECHNOLOGY

In laser thrombolysis, a laser beam is delivered to a blood clot through a fluid-core optical catheter. The yellow-green laser pulse delivered in the catheter is absorbed much more efficiently in a blood clot than in the surrounding arterial wall, which means that the clot can be heated and vaporized without damaging adjacent structures. The platelets in the clot are also destroyed, reducing the chance of a new clot forming from the released debris. Avoiding damage to the arterial wall is also important in the prevention of re-stenosis, or renewed narrowing. The laser thrombolysis procedure is monitored by radiography similar to more conventional angioplasty methods. Fortunately, because the x-ray-opaque dye used in these procedures is transparent to the laser beam's wavelength, the laser method is compatible with existing catheterization protocols.



Laser thrombolysis, pictured above, destroys blood clots using a laser beam. This method presents cost, recovery time, and safety advantages over methods such as bypass surgery.